APPENDIX F
List of Regulation Tanks

Appendix F
List of Regulation Tanks

Tabla 3.3.7
Regulation Tanks

Tank	*Colonias* (Neighborhood)	Elevation (mts)	Year of Construction	Capacity (m^3)
Aguaje de la Tuna	Aguaje de la Tuna	223.78	1982	30,000
Otay	Rancho Escondido	191.0	1992	20,000
Cerro Colorado	PIPILA	224.26	1991	20,000
Calafia	Calafia	52.00	1993	8,000
Sanchez Taboada	El Triunfo	360.0	1988	8,000
Panamericano	Panamericano	357.0	1987	8,000
Villa Fontana	Vilea Fontana	260.00	1998	7,000
Panque	Sección 10			
Aeropuerto	Aeropuerto	144.0	1993	5,000
Murua	Otay	135.8	1993	5,000
Rubi (SARH)	Ignacio Ramirez	286.3	1982	5,000
Obrera 3ra Sección	Obrera 3ra Sección	264.0	1993	5,000
A;ba Roja	Electricistas	59.00	1993	5,000
Playas 2	Xicontencatl	170.00	1992	5,000
Morelos	Morelos	58.79	1968	5,000
Herrera	Herrera	141.0	1968	5,000
Ejido Mazatlan	Ejido Mazatlan	55.00	1993	5,000
Reforma P/B	Reforma P/B	213.0	1990	4,500
Camino Verde 3	Cuauhtemoc	323.0	1995	4,500

Table 3.3.8
Primary Tanks

Tank	*Colonias* (Neighborhood)	Elevation (mts)	Year of Construction	Capacity (m^3)
Constitucion P/M	Constitucion	82.00	1999	4,000
Nueva Aurora	Nueva Aurora	260.00	2000	3,500
Tanque 1 Villa del Sol	Villa del Sol	222.80	2001	3,500
Loma Bonita	Loma Bonita	299.70	2000	3,000
Porticios San Antonio	Porticos San Antonio		1998	3,000
Florido	Florido 2 Seccion	224.0	1987	3,000
Lago Cuadrado	Lago	130.0	1981	3,000
Tanque 2 Villa Sol	No Disponible	286.40	2001	2,800
Playas 1	Lazaro Cardenas	115.0	1968	2,700
Independencia	Independencia	90.00	1968	2,700
Florido 4 Seccion	Florido 4 Seccion	200.00	1997	2,500
Las Aguilas	No Disponible		1999	2,500
Constitucion P/A	Constitucion	118.00	1999	2,500
Libramiento Oriente	Ballesteros	210.0	1992	2,000
Francisco Villa	Francisco Villa	196.2	1992	2,000
Ciudad Jardin	Ciudad Jardin	166.5	1992	2,000
Mirador	Lomas del Mirador	154.5	1992	2,000
5	Progreso	240.0	1968	2,000
Ejido Matamoros	Ejido Matamoros	283.0	1997	2,000
Pipila	Pipila	249.0	1998	2,000
Camino Verde 2	Camino Verde	215.0	1995	2,000
Alfa Panamerica	Panamericano	300.0	1990	2,000
Emperadores	Emperadores	190.0	1995	2,000
Guaycura P/A	Guaycura	135.0	1975	1,900

Table 3.3.8
Primary Tanks

Tank	*Colonias* (Neighborhood)	Elevation (mts)	Year of Construction	Capacity (m^3)
Ampl. Guaycura P/A	Ampl. Guaycura P/A	157.0	1978	1,800
Fundadores Norte	Fundadores Norte	282.0	1982	1,500
Residencial Aguas Caliente	Residential Aguas Caliente	270.0	1987	1,500
6	Valle Rubi	266.5	1969	1,500
Salvatierra	Salvatierra	235.40	2000	1,500
Aztecas P/B	Aztecas	125.0	1993	1,500
Aztecas P/A	Amp. Aztecas	262.0	1993	1,500
10	Urias	112.0	1972	1,500
Reforma P/A	Reforma P/A	251.0	1972	1,500
Juarez	Juarez	190.6	1970	1,400
4	Francisco Villa	185.0	1968	1,400
Latinos	Inf. Latinos	235.0	1984	1,400
Hacienda Del	No Disponible		1999	1,200
Lomas La Presa	Lomas La Presa	175.0	1991	1,200
Latinos 1	Inf. Latinos	235.0	1984	1,400
Lomas Verdes P/A	Inf. Lomas Verdes	138.0	1989	1,150
4	Guerrero	160.0	1968	1,130
Jardines del Rubi	Jardines del Rubi	275.0	1975	1,000
Britania	Lomas de Agua C.6 Seccion	127.0	1994	1,000
Herradura	La Herradura	191.5	1993	1,000
Montebello	Real de Monte	126.5	1975	1,000
Fundadores 2	La Sierra	205.0	1992	1,000
Las Cruces	Jardines las Cruces	303.0	1998	1,000
Cardenas 2	Lazaro Cardenas	189.0	1991	1,000
Miramar	Gran Tenochtitlan	198.0	1991	1,000
4 ½	Progreso	208.0	1968	1,000
Divina Providencia	Divina Providencia	189.75	2000	1,000
Nuevo Milenio	Porticos San Antonio	262.00	2001	1,000
Mariano Matamoros Sur	Mariano Matamoros Sur	253.00	1991	1,000
Ejido Fco. Villa	Ejido Fco. Villa	203.0	1992	1,000
Aztecas P/M	Aztecas	176.0	1993	1,000
Las Americas	Mariano Matamoros Norete	191.3	1994	1,000
Florido 4 Seccion 2	Florido 4 Seccion	220.00	1998	1,000
El Nino P/A	El Nino		2001	1,000
Jardines Mesa	3 de Octobre	185.0	1992	1,000
Camino Verde 1	Camino Verde	217.0	1995	1,000
Poblado el Tecolote	El Tecolote	344.0	1992	1,000

APPENDIX G
List of Pumping Stations

Appendix G
List of Pumping Stations

The Obrera Station has three 400 HP pumps; two of them operate continuously and the third is in reserve. The Morelos Station has two 400 HP pumps, one in continuous operation and the other in reserve. Finally, the Reforma Station has three 200 HP pumps; two of them operate continuously and the third is in reserve. In the Reforma Station, has two 60 HP pumps; one operating and the other in reserve. The three main pumping stations have a total combined pumping capacity of 2,720 HP.

APPENDIX H
Main Problems Observed with the Potable Water System

Appendix H
Main Problems Observed with the Potable Water System

Water treatment plants

Plants do not have enough electrical generators for maintaining operation in the absence of electricity. The El Florido Plant counts with an emergency power station, but it does not have sufficient capacity to provide energy to all the facilities, therefore it is only used for the clarifier pumps. The Abelardo L. Rodríguez Plant does not have an emergency plant.

The absence of water storage tanks that permit constant operation throughout the day.

Pumping stations

- Some equipment has been dismantled by vandalism, resulting in the need for constant maintenance.
- The equipment lacks protection fences
- Lack of maintenance of the facilities or the protection against corrosion
- Lack of reserve equipment, especially in the Reforma District, which has the most electromechanical equipment installed
- Absence of portable power stations that could be connected to pumping stations in case there would be no electrical energy available

Repumping

- Lack of maintenance of the equipment
- Lack of protection fences
- Some equipment has been dismantled

Regulation tanks

- Some tanks are out of operation due to filtrations in floors, cracked walls, destroyed fences, lack of doors, lids with asbestos plates in bad state, garbage in the interior and plumbing in bad conditions due to corrosion.
- Problems in the floors of the tanks, erosion of the land they are built in, and fissures in its structure. One of the greatest fissure problems is in the Aguaje de la Tuna Tank, which has 3-inch fissures.
- Lack of capacity in some tanks, such as 5.9 to 1,307 yd^3 (4½ to 1,000 m^3), that supply to other primary tanks. The need to improve the devices of level control.

- Tank rehabilitation in the Districts Ingeniero Juan Ojeda, Paraíso and Independencia, and especially Murua Tank.

- Valle de Rubí needs a tank with more regulation capacity. Its facilities are insufficient.

Wells

- Lack of equipment information in 13 of the existing wells

- The total power installed in the wells is 280 HP, with 15 HP to 40 HP motors. Equipment potential is unknown in 13 wells, three located in Playas de Rosarito that are out of service, one in Arroyo Alamar and the rest are located in Tijuana (LIST.SIST.ELEC.CESPT, 2001).

- Poor water quality in some of the wells due to high manganese concentrations

- Lack of pumping equipment in some wells

- Dismantled infrastructure

Pressure Reduction Valves

- Lack of preventive maintenance for calibrated valves (INF.PER.TEC)

- Lack of application of anticorrosive painting in plumbing

- Lack of maintenance of valves and records

Pressure Reducing Stations

- Lack of preventive maintenance (INF.PER.TEC)

- Lack of application of anticorrosive painting

- Lack of preventive maintenance for calibrated valves

Control Valves (section valves)

- Lack of maintenance in the valves and records (INF.PER.TEC)

- Problems with vandalism

- Valves that have remained buried due to street paving, which hinders the locations of valves to isolate leaks

Pipelines

- A high number of leaks due to the poor quality of the material used, the antiquity and high exercised pressures.

- Most of the leaks occur during water sampling, in the meter table, and a reduced number of them in the main pipelines.
- There are many 2 inches in diameter or smaller pipeline clogs.
- The pipeline that supplies the Rosarito District is inadequate to supply demand due to its limited capacity and the high number of leaks, given that the construction material is inappropriate.
- There is a need for the establishment of roads because there have been problems in the crossing of the pipelines by some properties.
- There is no program established for maintenance of the system. Most of the time the maintenance brigades are responding to emergencies and have very little time for the preventive maintenance in order to avoid future problems.
- There is no plan to avoid urban construction over the alignment of main aqueducts.

Hydrants (standpipes)

- Lack of maintenance
- Lack of protection against corrosion

Aqueducts and interconnection lines

El Florido and Aguaje de la Tuna:

- The existence of a fissure in the aqueduct provokes a small leak (located in the El Florido *colonia* (neighborhood))
- The lack of maintenance in admission and expulsion valves of air in most of the aqueducts

Cerro Colorado – Guaycura expansion:

- Has 5 leaks (year 2001) due to the fact that the float valve of the tank is not calibrated adequately and presents pressures of 140 lb/in^2, causing ruptures in the line given the poor quality of the materials (DIAG.CESPT, 2001 E INF).
- Inadequate operation of the air expulsion valves, some of which are silted or the record is found completely sealed

Glorieta Centenario - Reducing Pressure Stations Romero Manzo:

- The pressure of this aqueduct is considered inadequate due to the de-calibration it suffers in the reducing pressure station
- Two valves of air expulsion need maintenance, which are considered improper for their optimum operation location (3+030.18 and 4+474.8 km).

Otay – La Mesa:

- Provokes low pressures in some areas of the city

- Requires maintenance in the air expulsion valve located at 1+333.49 km (DIAG.CESPT, 2001 E INF.PER.TEC).

Planetario – Las Ferias:

- Lack of maintenance of the air expulsion valves, and some are found silted and flooded (DIAG.CESPT, 2001 E INF.PER.TEC).

Planetario – Las Ferias Segunda Sección:

- Requires rehabilitation of the expulsion and admission valves of air at 0+780.00 km, installation of air eliminators at 1+040.00 and 1+580.00 km, installation of two section valves in kilometers 0+590.00 and 0+690.00 (DIAG.CESPT, 2001 E INF.PER.TEC).

Reforma plant - Sánchez Taboada:

- The impulsion line is working improperly, given that the conditions of the pipeline are critical due to the presence of corrosion and recurring leaks and the, lack of maintenance to the expulsion and admission air valves (INF.PER.TEC).

Misión - Tijuana:

- Lack of preventive maintenance of the expulsion and admission air valves to avoid corrosion. The pipeline is not place on a bed of sand or insole, and recurring leaks occur while it is over rock, one of the most critical sections is located at 52+500 to 55+000 km (INF.PER.TEC).

In addition to the previously mentioned problems, critical defect points have been located on the aqueducts during rainfall periods, and facilities that are found in erosion and subsidence areas, which can affect various areas and interrupt water service. The location of these points is presented in Table 3.3.12.

Table 3.3.12
Defect Points of Aqueducts during Rainfall Periods

Aquaduct	Defect Point	*Colinas* (Neighborhood) Impacted
Florido-Otay	Arroyo Cerro de la Abeja	La Morita, Cerro Colorado, Otay, Ampliaciíon Guaycura, Cuaycura, El Lago y los Fraccionamiento Villa Fontana.
Florido-Otay	Cruce del Rio Alamar	Ampliación Guaycura, Ejido Matamoros, Villa Fontana, El Lago
Florido-Aguaje	Interconexión en Arroy La Morita	Zona poniente de la ciudad
	Morita	
	Entronque Gigante Florido	
	Cruce del Rio Tijuana	
	Cañón Salado	
Florido-Aguje	Cañón Popocatepetl	Zona poniente de la ciudad
Aguaje-Planetario	C. Melchor Ocampo, Col. Los	Obrera, El Rubí, La Sierra, La

Table 3.3.12 **Defect Points of Aqueducts during Rainfall Periods**		
Aquaduct	**Defect Point**	***Colinas* (Neighborhood) Impacted**
	Maestros	Cima, Francisco Villa, Ciudad Jardín, Infonavit, Herrera, Miramar, El Mirador, Lázaro
Obrera-Playas 1a. Etapa	Pluvia La Sierra	Fundadores, Juárez. Residencial Agua Caliente, Miramar, Lázaro Cárdenas, Playas de Tijuana
Obrera-Playas 2a. Etapa	Cañón de las Flores	Lázaro Cárdenas, Xicotencatl Leyva M., Cañón Rubén Amaya y Col. Macias
Obrera-Playas 2a. Etapa	Cañón Paredes	Zonas de influencia de los tanques Miramar, El Mirador, Cárdenas II y Cárdenas III
Tijuana-La Misión	Km 37 Carretera Tijuana-Ensenada	Desarrollos turísticos aledaños
Herrera-Playas	Cañón Cortés	Opciones de suministro (planta Herrera, Playas I y II)
Fuente: Plan de contingencies para las tormentas derivadas del niño en el invierno 1997-1998, CESPT)		

APPENDIX I
Potable Water System

Appendix I

- Table I-1 *Colonias* (neighborhoods) without potable water service
- Table I-2 CESPT Operations and Maintenance Manuals
- Table I-3 Works in process by Japanese Credit
- Table I-4 Existing relation and regulation of tanks in the study area
- Table I-5 Hydropneumatic Equipment

Table I-1
***Colonias* (Neighborhoods) without Potable Water Service - Areas with Low Pressure and Recurring Leaks by Operation District**

District	*Colonias* (Neighborhoods) without water service	Low Pressure Area		Recurring leaks	Immediate Rehabilitation
		Year round	During summer		
Ing. Juan ojeda Robles	(1) 10 de mayo (7) Granjas Familias unidas (8) Insurgentes	(12) Los Álamos (13) Nueva Tijuana	(2) Altabrisa (6) Ejido Chilpancingo (14) Otay Jardín (15) Otay Universidad (16) Tomas Aquino (17) Zona del Río	(3) Buena Vista (4) Ciudad Industrial (5) Cuauhtemoc (9) Libertad (10) Lomas Taurinas (11) López Leyva Aeropuerto	(9) Libertad (12) Los Álamos
Paraiso			(19) Ignacio Ramírez (23) Terrazas del Rubí (24) Valle Sur	(18) Fraccionamiento Rubí (20) Obrera (21) Sonoita (22) Sonora	(18)Fraccionamiento Rubí (20) Obrera
Independencia		(26) Ciudad Jardín (27) Francisco Villa		(25) Altamira (27) Francisco Villa (28) Zona Centro (29) Zona Norte	(28) Zona Centro (29) Zona Norte
Matamoros	(31) Ejido Francisco Villa (33) El Pipila (36) Héroes de la Independencia (43) Tierra y Libertad (45) Terrazas del Valle (46) Lomas del Valle (47) El Niño (48) Ejido Maclovio Rojas	(34) Florido Primera Sección (38) Mariano Matamoros Sur (39) Ejido Matamoros		(30) Ampliación Guaycura (32) El Lago (35) Guaycura (37) Infonavit Presidentes (40) Loma Dorada (41) Pórticos Lagos (42) Libramiento Zona AO (44) Torres del Lago	(32) El Lago (37) Infonavit Presidentes (44) Torres del Lago
Reforma (*5)	(49) 3 de octubre (50) Amparo Sánchez		(60) Reforma P/A	(51) Camino Verde (52) Campos (53) Castro Green (54) Infonavit Latinos (55) Infonavit Lomas Verdes (56) Jardines de la Mesa (57) Lomas Conjunto Residencial (58) Sanches Taboada (59) Villas de B. C.	(58) Sanches Taboada
Rosarito (*6)	(64) Mina (65) Plan Libertador (66) Ley Servicio Social (67) Ampliación Plan Libertador (68) Constitución (69) Ampliación Leyes Reforma		(61) Lucio Blanco (62) Constitución (63) Mazatlán (70) Magisterial (71) Labazo		(72) Zona Urbana (Poblado)

Table I-2 CESPT Maintenance and Operation Manuals	
Procedure	**Objective**
Office of Operational Control	
Aqueduct Inspection	The main objective is greater efficiency and speed in performing aqueduct inspection. It also aims to standardize norms and enable new personnel to more easily become familiar with and involved in performing inspections.
Special Studies	This procedure provides information on special studies activities, with step-by-step descriptions of the types of tasks performed in both the office and the field.
Potable Water Installations Inspection	This procedure provides detailed information on the activities performed in the inspection of potable water installations, primarily tanks, pressure-release stations, and pressure reductors. It describes, step by step, the methodology to follow in the office and field.
Potable Water Systems Inspection	Its basic purpose is to provide a detailed description of a sequence of steps to follow in performing an inspection of potable water systems by *colonias* (neighborhood). It includes a general analysis of all installations that form part of the water supply, describing the methodology and format of tasks performed in the office and the field. Its purpose is to achieve greater efficiency in our procedures and to identify the areas involved in their performance, while optimizing time, resources, and effort.
Detection of Invisible Leaks	To supply information and knowledge on methods and ways for detecting invisible leaks, the use of pipe-locator equipment, the use of various machines to detect invisible leaks and interpret data, managing data on identified leaks for their rapid repair, knowledge of the creation of hydrometric districts, how to find the percentage of water lost in those districts by comparing macro-metering to micro-metering.
Macro-metering and Pitometry	To supply information and knowledge on methods and ways for measuring flows and on equipment for taking measurements.
Potable Water Department (Departamento de Agua Potable)	
Procedures in the Area of Telemetry and Automation.	Establish the methods for monitoring the Tijuana and Playas de Rosarito telemetry system, through control of major re-pumping equipment, remote-control valves. Indicate the level of reduction of personnel working in tanks and pumping stations in those cities, avoiding spills, equipment failures, and water shortages, thus improving the operation of the system and the continuity of 23.88 hr service.
Procedures for Treatment of Potable Water at the Abelardo L. Rodríguez Treatment Plant	To supervise operation and maintenance of the elements involved in the procedures and/or stages for treatment of potable water, thus obtaining water of adequate quality, with the greatest output at the minimum possible cost. These objectives are achieved through five principal water treatment steps: coagulation, sedimentation, filtration, and disinfection.
Procedures for Treatment of Potable Water at El Florido Treatment Plant	To supervise operation and maintenance of the elements involved in the procedures and/or stages for treatment of potable water, thus obtaining water of adequate quality, with the greatest output at the minimum possible cost. These objectives are achieved through five principal water treatment steps: coagulation, sedimentation, filtration, and disinfection.
Procedures for Physical-Chemical Analysis of Potable Water	To analyze water samples from the potable water distribution system to determine qualitatively and quantitatively the presence of chemical and physical elements in potable water, as established by the Health Department (*Secretaría de Salud*) in accordance with NOM 127 SSA1-1994, the official Mexican regulations that establish the maximum allowable limits for physical, chemical, and bacteriological characteristics in treated potable water.
Procedures for Bacteriological Analysis of Samples from the Potable Water Distribution System	The routine bacteriological analyses of water samples is based on tests for the presence of indicator organisms, which include bacteria that are not always pathogenic. It is impractical to routinely analyze water samples for pathogens because of complications and delays in the applicable procedures.
Procedures for Analysis of Pesticides by Gas Chromatography	The official Mexican regulation (*Norma Oficial Mexicana*) NOM-AA-71-1981 establishes a method for detecting organochlorine pesticides using gas chromatography on plain and waste water. The methodology used is based on this regulation, with modifications to the form and volume of extraction, adapting the method to existing equipment

Table I-2 CESPT Maintenance and Operation Manuals	
Procedure	**Objective**
Office of Operational Control	
Procedures for Chemical Analysis of Potable Water Using Spectroscopy	Because of the diversity of chemical parameters that can be analyzed using this method, one single methodology is not applied invariably to all cases. However, the various specific methods consist basically in combining diverse reagents to generate a particular molecular species for the analyzed parameter, which only absorbs radiation in specific regions of the spectrum as a function of the substance's concentration. Finally, using a visible and ultraviolet radiation spectrophotometer, spectrophotometry provides quantified and qualified analysis.
Department of Land Use Registry (Departamento de Catastro)	
Structural Inspection	Along with measuring and collecting data (location, leveling, and inspection), an attempt will be made to physically improve the hydraulic infrastructure by performing supplementary work to improve the condition of the system, such as reporting structures requiring work, including, among other things, re-leveling of manhole covers and removing build-up of deposits which shrinks box size
Survey of Installations and Equipment	To physically improve the hydraulic infrastructure by performing supplementary work that improves the condition of the system, such as reporting structures requiring work, including, among other things, waterproofing, painting, and sidewalk construction.
Leveling of Manholes and Valve Boxes	Along with measuring and collecting data (location, leveling, and inspection), an attempt is made to physically improve the hydraulic infrastructure by performing supplementary work to improve the condition of the system, such as reporting structures needing work, including, among other things, re-leveling of manhole covers and removing build-up of deposits which shrink box size.
Department of Electromechanics (Departamento de Electromecánica)	
Procedure for Performing Preventive Maintenance on Submersible Turbine Pumps	To establish the sequence of steps so that maintenance is performed in a standardized and organized manner.
Procedure for Performing Preventive Maintenance on Centrifuge Pumps in the Re-Pumping System	To establish the sequence of steps so that maintenance is performed in a standardized and organized manner.
Procedure for Performing Preventive Maintenance on Submersible Well Pumps.	To establish the sequence of steps so that maintenance is performed in a standardized and organized manner.
Procedure for Performing Preventive Maintenance on Electricity Substations.	To establish the sequence of steps so that maintenance is performed in a standardized and organized manner
Procedure for Performing Preventive Maintenance on Pumping Station Control Panels.	To develop a series of steps to perform preventive maintenance on electrical monitoring equipment in a standardized and organized manner.
Procedure for Performing Preventive Maintenance on Re-Pumping Station Control Panels	To guarantee the proper functioning of equipment in order to provide uninterrupted service to the community.
Procedure for Performing Preventive Maintenance on Hydropneumatic System Control Panels	To guarantee the proper functioning of equipment in order to provide uninterrupted service to the community.
Procedure for Performing Preventive Maintenance on Well Control Panels	This procedure involves all the control panels for operating wells and extracting water from aquifers.
Procedure for Mechanical Anti-Corrosion Protection) (SAND BLAST)	To prolong the useful life of special parts and steel pipe carrying potable water and wastewater.

Table I-2 CESPT Maintenance and Operation Manuals	
Procedure	**Objective**
Office of Operational Control	
Procedure for Manufacturing Protective Coverings for Telemetry, Control, Release, and Chlorination Stations and for all other types of CESPT Installations	To protect all CESPT equipment in the field from vandalism.
Procedure for Manufacturing Clamps from 10" up to 30" with openings from 2" up to 24"	To establish a step-by-step sequence for the manufacture of clamps to connect a variety of parts (VAEA, pipes, vents, etc.) with differing diameters.
Procedures for Repairing Steel Pipes of 20" and Connection with Asbestos Cement Pipes	To establish an organized and logical sequence of steps to repair leaks in the potable water system.
Procedures for Repairing Leaks in the Damaged (Rusted) Steel Pipes in the Potable Water System, Ranging in Diameter from 2" up to 48"	To establish the step-by-step sequence for repair of leaks in steel pipes of various diameters
Procedure for Performing Preventive Maintenance Air-Release Valves	To establish the sequence of steps to perform preventive maintenance on air-release stations in a standardized and organized manner.
Procedure for Performing Preventive Maintenance on Level Control Valves in Storage and Pressure Reduction Tanks	To establish the sequence of steps to perform preventive maintenance on float valves in a standardized and organized manner, to guarantee the optimal functioning of the equipment with the goal of supplying continuous service to the community.
Procedure for Performing Preventive Maintenance Pressure Release Valves	To establish the sequence of steps to perform preventive maintenance on pressure reductor stations in a standardized and organized manner.
Procedure for Performing Preventive Maintenance on Centrifuge Pumps in the Hydropneumatic System	To establish the sequence of steps to perform preventive maintenance on air-release stations in a standardized and organized manner.
System Maintenance Department (Departamento de Mantenimiento de Redes)	
Meter Installation	Install efficiently and according to specifications residential meters requested by customers, with the goal of increasing the number of functioning meters in order to increase the volume of metered water.
Meter Replacement	Replace meters for users who request this as well as for those who have observed that their meters are out of order, with the goal of achieving 97.18% coverage for functioning meters within the population of CESPT registered customers.
Service Framework	Establish the methodology and format for describing the operational and administrative procedures in CESPT work areas. Increase efficiency and improve service by describing the procedures and the areas that they involve; promote and disseminate the culture and custom of using the procedures as a fundamental part of the introduction of quality systems.
Disconnection and Reconnection	Establish the methodology and format for describing the operational and administrative procedures in CESPT work areas. Increase efficiency and improve service by describing the procedures and the areas that they involve; promote and disseminate the culture and custom of using the procedures as a fundamental part of the introduction of quality systems.
Inspection of Dropped Accounts	Establish the methodology and format for describing the operational and administrative procedures in CESPT work areas. Increase efficiency and improve service by describing the procedures and the areas that they involve; promote and disseminate the culture and custom of using the procedures as a fundamental part

Table I-2 CESPT Maintenance and Operation Manuals	
Procedure	**Objective**
Office of Operational Control	
	of the introduction of quality systems.
Perform a Blowout of Residential Potable Water Connections	Establish step by step the methodology to achieve greater work efficiency for this type of team, maintaining an ongoing procedure evaluation in order to provide better service.
Repair of Leaks in Residential Potable Water Connections	Establish step by step the methodology to achieve greater work efficiency for this type of team, maintaining an ongoing procedure evaluation in order to provide better service.
Repair of Leaks in the Potable Water System	Establish step by step the methodology to achieve greater work efficiency for this type of team, maintaining an ongoing procedure evaluation in order to provide better service.
Service Installation (intake and discharge)	Establish step by step the methodology to achieve greater work efficiency for this type of team, maintaining an ongoing procedure evaluation in order to provide better service.
Procedure for replacement of connection	Establish the necessary techniques and tools to be used by the operator or service provider to perform connection replacements, to increase productivity and optimize resources.
Procedure to Move Meters	Establish the necessary techniques and tools to be used by the operator or service provider to perform connection replacements, to increase productivity and optimize resources.
Procedure moving meter boxes	Establish the necessary techniques and tools to be used by the operator or service provider to perform connection replacements, to increase productivity and optimize resources.
Inspection of Review of Minimums	Establish the methodology and format for describing the operational and administrative procedures in CESPT work areas.
Inspection of High Consumption	Establish the methodology and format for describing the operational and administrative procedures in CESPT work areas. To increase efficiency and improve service through the description of the procedures and the areas that it involves.
Inspection of Service Type	Establish the methodology and format for describing the operational and administrative procedures in CESPT work areas. To increase efficiency and improve service through the description of the procedures and the areas that it involves.
Replacement of Cover and Curb	Establish the methodology and format for describing the operational and administrative procedures in CESPT work areas. To increase efficiency and improve service through the description of the procedures and the areas that it involves.
General Procedure for Repaving	The work crew is responsible for reporting to the scheduling and statistics department when additional jobs (refilling or patching) are required, once the potable water or sewer system service is completed; the request will be forwarded to the repaving area if it is necessary to fill in trenches or replace pavement.
Inspection of Feasibility of Additional Meters	Establish the methodology and format for describing the operational and administrative procedures in CESPT work areas. To increase efficiency and improve service through the description of the procedures and the areas that it involves.
Inspection by Review of Averages	Establish the methodology and format for describing the operational and administrative procedures in CESPT work areas. To increase efficiency and improve service through the description of the procedures and the areas that it involves.
General Inspection	Establish the methodology and format for describing the operational and administrative procedures in CESPT work areas. To increase efficiency and improve service through the description of the procedures and the areas that it involves.
Clandestine Inspection	Establish the methodology and format for describing the operational and administrative procedures in CESPT work areas. To increase efficiency and improve service through the description of the procedures and the areas that it involves.

Table I-2 CESPT Maintenance and Operation Manuals	
Procedure	**Objective**
Office of Operational Control	
Procedure for Supplying Fuel to Official Vehicles	Establish the methodology and format for describing the procedures involved in carrying out the scheduling of teams in the System Maintenance Department.
Radio Supervision and Support for Work Crews	Install monitoring mechanisms and at the same time, use radio as a communications tool to support the operations of the Work Crews in the field.
Perform and Analyze Leak Studies	Establish the methodology and format for describing the operational and administrative procedures to perform and analyze studies on leaks.
Service Budgets	Establish the methodology and format for describing the operational and administrative procedures to develop a service budget.
Keeping Service Areas Current	Establish the methodology and format for describing the operational and administrative procedures to keep current the service area of the hydraulic infrastructure.
Procedure for Completion of Service Requests	Identify the factors involved in the process and its possible modification or adjustment, with the goal of obtaining greater efficiency in capturing and processing information.
Procedure for Developing Requisitions for Materials	Establish a methodology for developing requisitions for materials, maintaining widely used materials in the stockpiles for field units, thus reducing to a minimum time lost when repair crews must stop work to “request materials.”
Procedure for Developing Indicators District and Crew Indicators	Establish a methodology for developing indicators for the district and the work crews, identifying the factors involved in the process and its possible modification or adjustment, with the goal of obtaining greater efficiency in the generation, processing, and monitoring of information.
Procedure for Developing Requests for Work from External Shops	Establish a methodology for developing the requests for work from external shops that provide preventive and corrective maintenance of commonly used devices, machinery, and smaller equipment, in order to maintain these items in good service condition, thus reducing to a minimum time lost when the repair crew must stop work because of “out-of-order devices or equipment.”
Procedure for Developing the Preventive Maintenance Program for Machinery	Establish a methodology for developing a preventive maintenance program for machinery, to maintain an adequate schedule that works to maintain devices and support equipment in good service condition, thus reducing to a minimum time lost when devices are sent to the repair shop, which affects the scheduling of service.
Supplying Fuel to Special Units	Establish the methodology and format for describing the operational and administrative procedures in CESPT work areas. To increase efficiency and improve service through the description of the procedures and the areas that it involves.
Note: These descriptions are a summary of each manual’s principal goals.	

Table I-3
Works in Process of Execution by 2002, 2003 and 2004 by Japanese Credit

Number	*Colonias* (Neighborhood)	Population	Sample	Pump	Tank	System (m)	Conveyance (m)	Totals
		Inhab.	Item	HP	Cap. (m3)	4"-12"	14"-20"	(m)
1	03 de Octubre	19,454	4,632	150	3500	36,873	1,195	38,068
2	Buenos Aires expansion	4,213	1,003	---	---	10,023	0	10,023
3	Agraristas expansion	2,982	710	---	---	9,492	0	9,492
4	Terrazas del Valle	20,194	4,808	---	2,500	43,907	1,712	45,619
				50	1,500			
				15	1,000			
				---	500			
Subtotal	46,843	11,153	215	11000	100,295	2,907	103,202	
Number	Neighborhood	Population	Sample	Pump	Tank	System (m)	Conveyance (m)	Totals
		Inhab.	Item	HP	Cap. (m3)	4"-12"	14"-20"	(m)
1	Las Águilas expansion	7,367	1,754	40	2,000	28,627	0	28,627
				10				
2	Lomas de Rosarito	14,603	3,477	75	2,500	59,379	0	59,379
				125	2,000			
Subtotal	21,970	5,231	250	6500	88,006	---	88,006	
Potable water works, contemplated until 2003 by Japanese Credit								
Number	Neighborhood	Population	Sample	Pump	Tank	System (m)	Conveyance (m)	Totals
		Inhab.	Item	HP	Cap. (m3)	4"-12"	14"-20"	(m)
1	Lázaro Cárdenas expansion	1,945	463	10	215	2,471	0	2,471
2	Mariano Matamoros expansion	21,256	5,061	10	---	44,156	0	44,156
3	Pipila expansion	3,318	790	---	---	8,991	0	8,991
4	Ampl. Ejido Francisco Villa	11,214	2,670	---	4,000	23,136	1,146	24,282
5	Ojo de Agua-Maclovio Rojas	8,270	1,969	75	4,000	38,345	3,366	41,711
					2,000			
6	Plan Libertador de Rosarito	8,715	2,075	10	1,000	44,333	0	44,333
7	Santa Mónica Reforma	4,704	1,120	---	3,000	17,371	2,557	19,928
8	Plan Libertador expansion	11,302	2,691	30	1,000	39,795	0	39,795
9	Water meters	81,577	19,423	---	---	---	---	---
Subtotal	70,724	16,839	135	15215	218,598	7,069	225,667	
Potable water works, contemplated until 2004 by Japanese Credit								
Number	Neighborhood	Population	Sample	Pump	Tank	System (m)	Conveyance (m)	Totals
		Inhab.	Item	HP	Cap. (m3)	4"-12"	14"-20"	(m)
1	Cuesta Blanca Ley del Servicio Ci	882	210	---	---	6,669	0	6,669
2	Tecolote Tercera Sección	714	170	15	250	5,102	0	5,102
3	Granjas Amparo Sánchez	1,894	451	---	---	11,593	0	11,593
4	Viñedos Casa Blanca	3,721	886	---	---	12,005	0	12,005
5	Maclovio Rojas expansion	1,575	375	50	2,000	26,168	0	26,168
				30	250			
6	Water meters	66,746	15,892	---	---	---	0	0
Subtotal	8,786	2,092	95	2500	61,537	0	61,537	

Table I-4
Existing Relation between Tank and Regulation in the Study Area

Name of Tank	Physical State	Type	Elevation (m)	Year of Construction	Capacity (m^3)	Dimensions			
						Diameter	Length	Width	Height
Aguaje de la Tuna	1	se	218.00	1982	30,000				
Otay	1	s	191.00	1992	20,000				
Cerro Colorado	1	s	223.00	1991	20,000				
Calafia	1	s	52.00	1993	8,000				
Sánchez Taboada	1	s	360.00	1988	8,000				
Panamericano	1	s	362.14	1987	8,000				
Villa Fontana Parque	1	s	260.00	1998	7,000				
Aeropuerto	1	s	144.00	1993	5,000				
Murua	1	s	136.00	1993	5,000		35.20	35.20	4.60
Rubí (Sarh)	1	s	286.36	1982	5,000				
Obrera 3 Sección	1	se	264.00	1993	5,000				
Alba Roja	1	s	75.95	1993	5,000				
Playas 2	1	s	170.00	1992	5,000		35.35	35.35	5.00
Morelos	1	se	59.00	1968	5,000				
Herrera	1	se	144.00	1968	5,000				
Ejido Mazatlán	1	s	52.22	1993	5,000				
Reforma p/b	1	se	216.00	1990	4,500				
Camino Verde 3	1	se	323.00	1995	4,500				
Constitución p/m	1	s	87.00	1999	4,000				
Nueva Aurora	1	s	265.58	2000	3,500				
Tanque 1 Villa del Sol	1	s	222.80	2001	3,500				
Loma Bonita	1	s	299.70	2000	3,000				
Pórticos San Antonio	1	s	294.50	1998	3,000				
Florido	1	s	224.00	1987	3,000		35.5	20.48	4.57
Lago Cuadrado	1	se	144.96	1981	3,000		41.60	41.33	3.00
Tanque 2 Villa del Sol	1	s	286.40	2001	2,800				
Playas 1	1	se	115.00	1968	2,700	21.2			7.5
Independencia	1	s	93.98	1968	2,700				
Florido 4 Sección	1	s	200.00	1997	2,500		32.46	16.3	5.1
Las Águilas	1	s	175.00	1999	2,500				
Constitución p/a	1	s	120.34	1999	2,500				
Libramiento oriente	1	s	210.00	1992	2,000				
Francisco Villa	1	s	196.20	1992	2,000		25.20	20.30	5.20
Ciudad Jardín	1	s	167.00	1992	2,000				
Mirador	1	s	155.00	1992	2,000				
5	1	e	240.00	1968	2,000				
Ejido Matamoros	1	s	292.91	1997	2,000		20.06	25.00	5.00
Pipila	1	s	249.00	1998	2,000		30.25	15.32	5.00
Camino Verde 2	1	s	215.00	1995	2,000		25.00	20.00	5.00
Alfa Panamerica	1	se	300.00	1990	2,000				
Emperadores	1	s	191.64	1995	2,000		24.98	19.9	5.92
Guaycura p/a	1	s	138.12	1975	1,900	24.10			4.10
Ampliación Guaycura p/a	1	s	166.23	1978	1,800	24.50			3.90
Fundadores Norte	1	se	282.00	1982	1,500				
Residencial Agua Caliente	1	s	270.00	1987	1,500				
6	1	s	266.50	1969	1,500				
Salvatierra	1	s	236.84	2000	1,500				
Aztecas p/b	1	s	126.77	1993	1,500				
Aztecas p/a	1	s	262.00	1993	1,500				
10	1	s	112.00	1972	1,500				
Reforma p/a	1	se	251.00	1972	1,500				
Juárez	1	se	190.60	1970	1,400				
4'	1	s	185.00	1968	1,400				
Latinos	1	s	234.69	1984	1,400				
Hacienda	1	s	------	1999	1,200				
Lomas la Presa	1	s	181.16	1991	1,200		19.80	19.80	3.03
Latinos 1	1	s	235.00	1984	1,200				
Lomas Verdes p/a	1	s	138.00	1989	1,150				
4	1	s	160.00	1968	1,130		16.80	16.70	4.70
Jardines del Rubí	1	s	276.28	1975	1,000				
Britania	1	e	127.00	1994	1,000				
Herradura	1	s	191.50	1993	1,000				
Montebello	1	s	126.50	1975	1,000		25.10	15.10	2.96
Fundadores 2	1	s	205.00	1992	1,000				
Las Cruces	1	s	303.00	1998	1,000				
Cárdenas 2	1	s	189.00	1991	1,000				
Miramar	1	s	198.00	1991	1,000				

Table I-4
Existing Relation between Tank and Regulation in the Study Area

Name of Tank	Physical State	Type	Elevation (m)	Year of Construction	Capacity (m^3)	Dimensions			
						Diameter	Length	Width	Height
4 1/2	1	se	208.00	1968	1,000				
Divina Providencia	1	s	189.75	2000	1,000				
Nuevo Milenio	1	s	262.00	2001	1,000				
Mariano Matamoros Sur	1	s	253.00	1991	1,000		15.29	15.29	5.00
Ejido Francisco Villa p/b	1	s	203.00	1992	1,000		15.53	15.53	5.10
Aztecas p/m	1	s	176.00	1993	1,000				
Las América	1	s	191.30	1994	1,000				
Florido 4 Sección 2	1	s	220.00	1998	1,000		15.40	15.30	5.10
El Niño p/a	1	s	--------	2001	1,000				
Jardines Mesa	1	s	188.55	1992	1,000				
Camino Verde i	1	s	219.18	1995	1,000		16.00	16.00	5.00
Poblado el Tecolote	1	se	349.36	1992	1,000				
Soldados	1	s	316.00	1970	960				
3-b Pasteje	1	se	129.00	1970	900		20.95	20.6	2.65
Burócratas	1	se	200.00	1975	800				
Consulado	1	se	60.00	1972	800				
Chapultepec 8 Seccion	1	se	160.00	1967	800		24.80	14.85	2.50
Padre Kino	1	s	102.02	1977	800	14.85			4.90
Presidentes p/a	1	s	161.82	1983	800				
La Presa	1	s	160.00	1981	800		22.15	21.25	-----
Villas Baja California.	1	se	170.00	1989	800		28.00	12.00	2.38
Villas Baja California. p/m	1	s	158.00	1989	800		20.00	16.00	2.80
Indeco Universidad	1	s	146.00	1981	600		15.90	11.70	3.00
Lomas Colorado	1	s	105.00	1978	600				
El Niño p/b	1	s	-------	2001	600				
Villas Baja California p/a	1	s	197.22	1989	600		20.00	11.00	3.10
Venezolanos	1	s	200.00	1986	600		16	12	3
Laderas de Monterrey	1	s	161.00	1996	590				
22-a	1	se	122.00	1967	500		18.10	13.10	2.50
22-b	1	se	122.00	1967	500				
Olivos p/a	1	se	163.00	1970	500				
Colinas Agua Caliente p/a	1	se	236.00	1975	500				
Florido 3	1	s	219.70	1993	500		17.50	6.50	4.00
Loma Dorada	1	s	125.00	1996	500				
Emiliano Zapata y San	1	s	-------	1998	500		9.70	9.70	3.57
70-76	1	s	150.00	1976	400		15.54	10.55	2.90
Colinas Agua Caliente p/b	1	se	185.00	1975	400				
Capistrano p/m	1	se	136.90	1983	400				
Capistrano p/a	1	se	183.40	1983	400				
Presidentes p/a	1	s	175.00	1983	400				
Brasileños	1	s	185.00	1986	400		16.50	12.30	3.00
Trigarante	1	s	165.50	1986	400		16.01	12.01	3.1
La Ladrillera	1	s	--------	2001	350				
Villa Floresta p/m	1	se	127.00	1976	325		14.80	10.40	2.50
Privada Acapulco	1	s	124.00	1970	300				
Venustiano Carranza	1	s	107.00	1997	300				
Lomas Conjunto p/m	1	s	158.24	1970	300		9.50	9.50	2.48
Guanajuato	1	s	125.00	1988	300		10.05	10.05	3.65
La Gloria	1	s	306.07	1994	300				
Ejido Francisco Villa p/a	1	s	226.20	1992	215		10.20	10.20	2.50
Cárdenas 3	1	s	210.50	1993	215				
Del Río p/b	1	se	94.82	1970	200		9.55	9.30	2.80
Echeverría	1	s	231.00	1990	200				
Remosa	1	s	200.50	1990	200				
Doctores	1	s	130.00	1970	200				
Villa Floresta p/b	1	s	75.00	1976	200		10.00	5.00	1.78
Lomas Conjunto p/a	1	s	185.00	1970	200		9.20	10.50	2.50
Mariano Matamoros p/b	1	s	217.00	1991	100		1041	5.18	2.20
Mariano Matamoros Hidro	1	s	206.00	1991	100		10.45	5.40	2.25
Aguajito	1	s	225.00	1984	50				
Mezclador	4	s	20.00	1968	7,900				
Fundadores 1	4	s	205.00	1988	2,000				
Juárez 2	4	se	205.00	1993	2,000				
Cárdenas 1	4	se	159.00	1982	2,000				
Chapultepec 9 Seccion	4	s	221.16	1975	1,400				
Villas Baja California p/b	4	se	133.00	1989	1,000		17.80	13.80	4.35
4'	4	se	185.00	1968	900				

Table I-4
Existing Relation between Tank and Regulation in the Study Area

Name of Tank	Physical State	Type	Elevation (m)	Year of Construction	Capacity (m^3)	Dimensions			
						Diameter	Length	Width	Height
Lomas Verdes p/b	4	se	115.00	1989	800				
Altamira	4	se	168.00	1982	650		14.63	9.65	4.95
Cacho p/a	4	s	118.00	1970	300				
Guerrerito	4	s	126.00	1968	300		10.90	10.90	3.80
Mezclador	5	e	20.00	1968	17,000				
Britania	5	e	127.00	1970	4,480				
Fovisste 5 Etapa	5	se	135.00	1978	2,400				
San Antonio del Mar 1	5	s	82.00	1975	2,000				
San Antonio del Mar	5	s	60.00	1975	2,000				
Otay Universidad 1	5	s	147.00	1981	1,600	24.25			4.85
Lago Redondo	5	s	130.00	1976	1,600	19.41			5.65
Álamos	5	s	87.30	1975	1,500		21.72	17.62	4.40
Ampliación Guaycura p/b	5	s	80.00	1978	1,200				
Otay Universidad II	5	se	147.00	1981	1,100		29.90	12.85	3.20
Chichimecas	5	se	132.00	1982	900				
Fovisste 5 Etapa	5	se	132.86	1978	900				
Fidel Velásquez	5	s	89.50	1984	760				
Patrimonio Murua	5	s	40.00	1984	750				
4	5	s	160.00	1968	700				
Villa Floresta	5	s	20.68	1978	500				
Plan de Iguala	5	s	115.00	1984	500				
Calle 8	5	se	115.40	1970	400				
Obrera	5	e	264.00	1982	400				
Morelitos	5	se	80.00	1968	350		16.18	10.98	4.00
Independencia	5	se	90.00	1968	340		30.70	25.80	4.20
Villa Floresta p/a	5	se	127.00	1976	325		15.19	8.24	2.60
Las Californias	5	s	150.00	1979	300				
6'	5	s	234.00	1969	300				
Lago p/b	5	s	55.00	1976	300				
Mirador Viejo	5	s	182.40	1970	250				
Jardines del Rubí Viejo	5	s	255.00	1970	200				
Privada Acapulco	5	s	124.00	1970	200				
Roma	5	se	118.00	1970	200				
Guaycura p/b	5	e	59.00	1975	200				
Presidentes	5	e	120.00	1983	200				
Los Laureles	5	se	170.00	1982	190				
Panteón	5	se	160.00	1968	170				
Olivos p/m	5	s	153.00	1970	120				
Madero Sur	5	se	180.00	1970	80				
Fidel Velásquez	5	se	75.00	1984	40				

Nota :
1.- Operating
4.- Out of Operation
5.- Definite discharge
Note: The information obtained on the tank dimensions diagnosis is only until December 2001.

Table I-5
Installed Hydropneumatic Equipment, Installment and Capacity Periods

Hydropneumatic	No. of Equipments	Equipment Potential (HP)	Total Potential (HP)
Loma Bonita	2	5	10
Sánchez Taboada	2	3	6
Ciudad Misericordia	2	7.5	15
Hermosillo	2	7.5	15
Tecolote	2	7.5	15
Las Cruces Parte Alta	2	5	10
Miramar	2	7.5	15
Venustiano Carranza	2	15	30
Colonia Lagunitas.	2	5	10
Obrera 3a. Sección	2	10	20
Chapultepec California	2	15	30
El Pipila	2	10	20
Pacífico	3	3	9
Ed. #1 Blvd. Benítez	2	7.5	15
Cañón del Sáenz.	2	15	30
Resid. Agua Caliente	2	15	30
Ejido Mazatlán Rosarito	2	7.5	15
Lomas del Valle.	2	7.5	15
Rubi Terrazas	2	10	20
Florido 4ta. Sección	3	3	9
Tanque Otay	2	5	10
Lomas de Matamoros	2	7.5	15
Capistrano Parte Alta	2	5	10
Primo Tapia	2	5	10
Ladrilleras Puerto Nuevo	2	15	30
Hidroneumático	2	7.5	15
Total			**429**

Note: In all cases, reserve equipment is accounted for and the rest operate continually.

APPENDIX J
Wastewater System

Appendix J

- Table J-1 Location of pumping plants and lift stations
- Table J-2 Pipeline length listed by pipe diameter
- Table J-3 Tijuana and Playas de Rosarito sewer and subcollector characteristics
- Table J-4 *Colonias* (neighborhoods) where pipelines needing rehabilitation have exceeded there useful life
- Table J-5 Problems and operating conditions for sewers and subcollectors
- Table J-6 *Colonias* (neighborhoods) lacking sewer service
- Table J-7 Projects (rehabilitation) using CESPT funds
- Table J-8 Projects (rehabilitation) using EPA funds through CESPT
- Table J-9 Planned Japanese Credit projects

Table J-1
Location of Pumping Plants and Small Pumping Stations

Installation Code	Name	Location	*Colonia* or Subdivision	System and Horse Power		Year of Construction
35220	SEDUE Playas Plant	Av. del Pacífico and C. Madrid	Playas de Tijuana	2+2	(250 HP, 250 HP, 250 HP, 125 HP)	1988
35219	PB 1 A	Avenida Internacional	Zona Norte	3+1	(1500 HP, 1500 HP, 1500 HP, 1500 HP)	---
	PB 1 B	Avenida Internacional	Zona Norte	4+1	750 HP (10), 5 HP (10)	2001
35218	CILA Plant	C. Alderete	Zona Centro	2+1	(75 HP, 75 HP, 75 HP)	1985
35212	Matadero Plant	Libramiento Sur Cañón del Matadero	Cañón del Matadero	3+2	(5 pumps of 250 HP)	1991
35214	Bahía la Palmas	C. Bahía de las Palmas and C. Bahía de la Paz	Mirador	1+1	(7.5 HP, 7.5 HP)	1995
15203	Cañón Emiliano Zapata	Cañón Emiliano Zapata and C. 13	Libertad p/a	1+1	(25 HP, 25 HP)	1993
55204	Cb-1 Duna	C. Duna	San Antonio del Mar	1+1	(10 HP, 15 HP)	1975
55205	Cb-2 Marejada	C. Marejada and C. Roca	San Antonio del Mar	1+1	(10 HP)	1975
55206	Cb-3 Bahía	C. Bahía and C. Marea	San Antonio del Mar	1+1	(30 HP, 13.4 HP)	1975
55207	Cb-4 del Mar	C del mar and C. Playa	San Antonio del Mar	1+1	(5 HP, 5 HP)	2001
35216	Centro Recreativo	Av. Pacífico and C. Parque México	Playas de Tijuana	1+1	(2.8 HP, 2.8 HP)	1994
55201	Transmitter Rosarito	C. Costa Azul	Zona Centro	2+1	(75 HP, 75 HP, 75 HP)	1994
65202	Lomas Verdes	Cerrada Loma Blanca	Inf. Lomas Verdes	1+1	(7.5 HP, 7.5 HP)	1989
35213	Los Laureles	Paseo de la Montaña	Cañón los Laureles	2+2	(180 HP, 100 HP, 180 HP, 180 HP)	1993
35203	Mirador p/b	Blvd. Mirador between C. Playas and C. Bufadora	Mirador	2+1	(25 HP, 25 HP, 25 HP)	1993
55202	Papas and Beer	C. Coronado and C. Eucalipto	Barbachano Rosarito	1+1	(5 HP, 5 HP)	1991
35201	Malecón Playas (Monumental)	Av. Del pacifico and Av. Parque México	Playas de Tijuana	2+1	(25 HP, 25 HP, 25 HP)	1995
35217	Punta Bandera	Tijuana -Ensenada Scenic Highway, km 18	Punta Bandera	3+1	(5 pumps of 250 HP)	1986
35215	Residencial Jardines (Calimax)	Priv. Obelisco and Av. Azucenas	Residencial Jardines	1+1	(5 HP, 5 HP)	1990
35204	Soler	C. Heraclio Bernal and C. Diego de Porto	Soler	1+1	(7.5 HP, 7.5 HP)	1995
55208	Puerto Nuevo	C. Paseo del mar and C. Barracuda	Puerto Nuevo	1+1	(5 HP, 5 HP)	---

--- Information from CESPT was not available.
2+2 = First number are pumps operating, second number are reserved pumps.
Small pumping plants that move water from low-lying areas and that don't have a natural escape.
Source: Catastro de Instalaciones y Equipos 2001 (Cadastre of Facilities and Equipment 2001), Departamento de Control Operacional (Dept. of Operational Control), Oficina de Catastro (Office of Cadastre), CESPT.

Table J-2
Pipeline Length Listed by Pipe Diameter

Sewage System		Sewage System	
Diameter (cm)	**Longitude (m)**	**Material**	**Longitude (m)**
10	454.58	Clay	150499.27
15	9,816.71	Concrete	1,138,412.01
20	2,132,024.86	PVC	1,337,165.60
25	89,251.59	Steel	154.85
30	115,933.52	Estrupak	4810.29
38	49,349.13	Fo.Fo.	144.1
45	37,342.63	Not specified	49,365.07
53	16,550.57		
61	34,173.59	Total	2,680,551.19 m
76	19,830.91		
91	21,796.52	Storm drains	117,681.40 m
107	17,581.92		
122	4,761.81	**Total**	**2562,869.79 m**
136	1,641.66		
152	6,863.68		
183	6,516.85		
Total	**2,563,890.53 m**		

Source: CESPT inventory, Surveying Department (*Departamento de Catastro*), August 2002.
Note: The existing infrastructure installed south of the urban center in Playas de Rosarito is not included.

Table J-3

Characteristics of the Sewage Subcollectors and Collectors of Tijuana and Playas de Rosarito

Name	Location	*Colonias* or Sewage Collectors from which Wastewater Is Received	Pipeline Material and Diameter	Length
Oriente Sewage Collector	Begins in the Ejido Chilpancingo on the streets Av. Murua and Venustiano Carranza.It proceeds along Avenida Murua, until Avenida Cañón del Padre, arriving near Vía Rápida Oriente, where it empties into the Interceptor Poniente at the height of the Agua Caliente bridge.	Ruiz Cortines, part of La Libertad, Empleado Postal, Del Río, Anexa del Río, Aeropuerto, Centro Urbano 70-76, Lomas Taurinas, Anexa Lomas Taurinas, Otay Insurgentes, Mineral Santa Fe, Alta Brisa, Tomás Aquino and Universidad de Baja California.	Reinforced Concrete and PVC; of 53, 61, 76, 91, 107, 122 and 183 cm	14.730 km
Alamar Sewage Collector	Runs along the edge of the Alamar arroyo, beginning in the Colonia Valle Verde and ending at the discharge of the Insurgentes sewage collector, on Calle Camino al Aeropuerto in the Colonia Chapultepec Alamar	Valle Verde, Jardín Dorado, Buenos Aires, Loma Bonita, Ampliación Loma Bonita, Patria Nueva, Meseta del Guaycura, Colinas del Alamar and El Lago.	PVC, of 53, 61, 76, 91 and 107 cm	6.750 km
Central Sewage Collector	Begins on the corner of Agua Caliente Boulevard and Francisco I. Madero in the Zona Centro (downtown) and ends in the Zona Norte where the sewage collector V. Carranza and the Interceptor Internacional meet, next to pumping plant PB-1	Madero Sur, México, Morelos, Los Maestros, Cumbres de Juárez, Guadalajara, Aguadores del Rubí and the Fundadores Sewage Collector, as well as part of the Zonas Centro and Este.	Concrete and P.A.D of 60, 45, 38, 30, and 25 cm	2.880 km
Ensenada Maclovio Herrera Sewage Collector	The sewage collector Ensenada Maclovio Herrera is located in the Cañón de la Piedrera (La Piedrera Canyon)	Guerrero, Francisco Villa, Leandro Valle, de los Maestros, Planetario, Chulavista, Cubillas and Caletes among others, discharge into the Sánchez Taboada Sewage Collector.	Concrete and PVC of 25, 38 and 45 cm	5.500 km
Ferrocarril Sewage Collector	Begins in the Colonia Reforma on the Calle Emiliano Zapata, continuing along the Calle Prolongación México Lindo, until emptying in the Interceptor Poniente at the intersection of the Calles Cerro Colorado and the old road to Tecate.	Reforma, Colinas de la Mesa, Loma Dorada, Anexa Loma Dorada, part of Jardines de la mesa and México Lindo.	PVC of 20, 25, 30, 38 cm	7.860 km
Insurgentes Sewage Collector	Begins in the Colonia Azteca, develops along the Insurgentes Boulevard until arriving at the Alamar arroyo, where it discharges at the Oriente sewage collector	Praderas, Kino, Azteca, Fidel Velásquez, Villacruz, López Portillo and Capistrano, as well as the sewage subcollectors that capture water from the following colonias: Presidentes, Saucillos, Ávila and Guaycura and the Matamoros and Campiña Sewage Subcollectors,	PVC, Permaloc, Reinforced Concrete and Plain Concrete, of 61, 91, 107, 122 and 153 cm.	7.890 km
La Gloria Sewage Collector	Begins its stretch in the Colonia La Joya, proceeds along the freeway Ensenada- Tijuana, until arriving at the Cañón de San Antonio, next to the training barracks in the Zona Militar No. 5. The sewage collector discharges to the open air in the San Antonio Canyon.	Jardines de la Gloria, La Joya and Monarca	PVC, of 30, 45 and 61 cm	4.570 km
Pastejé Sewage Collector	Begins on the Calle Gral. Plutarco Elías C. and Rene Treviño in the Colonia Lomas Taurinas.It continues along the Cañón Pastejé to Cuauhtemoc Norte Boulevard, Paseo Centenario and ends on the Calle Juan Ruiz de Alarcón and Paseo de la Juventud in the Zona del Río	This work began operation in 1993 arising from the critical situation provoked by the surface run-off in the arroyo Pastejé, which looked unsanitary and left a bad image.	PVC and Reinforced Concrete of 25, 38, 45 and 61 cm	4.840 km
Name	Location	*Colonias* or sewage collectors from which wastewater is received	Pipeline Material and Diameter	Length
Playas Sewage Collector	Located along the Calle Paseo Playas de Tijuana and ends at the Pumping Plant SEDUE Playas	Receives wastewater from the sections of Playas de Tijuana:the Terrazas section, Playas Coronado, Monumental, Jardines, Rivera, Jardines del Sol, Dorado, Costa de Oro and Costa de Hermosa.	Reinforced Concrete of 45,53, 76 and 91cm	2.400 km
Sánchez Taboada Sewage Collector	The Poniente Sewage Collector in the Zona del Río, 1st Stage, was named "Colector Sánchez Taboada".	Receives wastewater from the Poniente (Western) Interceptor	Reinforced Concrete of 107, 91 and 61 cm	7.216 km
Tecolote Sewage Collector	Begins in the *Colonia* el Tecolote and empties into the La Gloria sewage collector.	Tecolote and Genaro Vázquez	PVC, of 38 and 45 cm	5.200 km
V. Carranza Sewage Collector	Begins at the corner of Calle 8 and Av. Huitzilac in the Zona Centro and ends at the Pumping Plant PB-1 where the Central Sewage Collector and the International Interceptor meet.	Rancho la Cima, Hidalgo, Francisco Villa, Progreso, Guerrero, Independencia, Azcona, part of the Zona Centro, Patrimonial Benito Juárez, 1er. Ayuntamiento, Roma, Herrera, Anexa Roma, Unión, Santa Rosa, Linda Vista, Castillo, Alemán, Lomas Misión y Soler.	Clay, PVC and Concrete of 30, 60, and 76 cm	3.400 km
Poniente Interceptor	Begins in the town of La Presa and ends at Pumping Plant No. 1.	Western area of the Tijuana River, through the following sewage collectors: Ferrocarril, Rosario, Libramiento and Oriente.	PVC and Reinforced Concrete of 25, 30, 38, 45, 61, 91, 107, 122 and 183 cm	20.662 km
Old INV Sewage Collector	Begins on the Calle Ciprés on the corner with Pino in the Colonia Ciudad Jardín, ending in a transition box of the old withdrawal system "líneas cuatas". (Twin lines)	Began operating in 1968 and since 1992 has not worked as a sewage collector, but has been used as a water conduit instead.	Concrete of 25, 30, 38 and 45 cm	2.570 km
New INV Sewage Collector	Begins in the Rubí Subdivision, continues along the Cañón del Pato, Libramiento Oriente and ends at the Matadero Pumping Plant (PB-3)	Replaced in great part the old sewage collector INV, beginning operation in 1992, receving wastewater from the Old INV Sewage Collector.	Reinforced Concrete and PVC of 91, 61, and 45 cm	8.100 km
Padre Kino Sewage Subcollector	Located in the eastern part of the city, bordered by the right bank of the Tijuana River, the International border and the old Aeropuerto Federal	Libertad, Ruiz Cortinez, Empleado Postal, Del Río, López Leyva, Aeropuerto, Tomás Aquino, Buena Vista, Anexa Buena Vista and Sepanal.	Concrete of 61 and 76 cm	2,300 km
Emiliano Zapata Sewage Subcollector	Runs along the Cañón Otay of the Colonia Libertad. It merges into the Zona del Rió, connecting to the old Oriente (Av. Padre Kino) Sewage Collector, ending at the Oriente Interceptor on the International border	Receives wastewater from the Emiliano Zapata station and part of the Colonia Libertad.	PCV and Steel of 20, 38, 45 and 65 cm.	3.780 km
Industrial Sewage Subcollector	Begins in the Zona Industrial and empties into the Oriente sewage collector at the height of the Calle Cósala and Av. Murua Martínez	Receives wastewater from the Zona Industrial, Colonia Roberto de la Madrid, Technology section, and part of the Campestre Murua	PVC of 30, 45, 61, 76, and 91 cm	3.800 km
Matamoros Sewage Subcollector	Begins on the Calle Ruta Mariano Matamoros, at the corner with Camino Fuerte in the Colonia M. Matamoros Norte, and runs along the Ruta M. Matamoros, toward the Ciudad Industrial, emptying into the Insurgentes Sewage Collector	Mariano Matamoros Norte, Parque Industrial Américas Este and Oeste, Baja Maq. El Águila and part of the Colonia Guaycura.	PVC of 38, 45, and 61 cm	4.540 km
Olivos Sewage Subcollector	Begins at the intersection of the Las Californias Avenue and the arroyo of the Colonia Pípila. It runs along the arroyo to Calle Sauce in the Colonia M. Matamoros Sur and empties into the Insurgentes sewage collector.	Florido III, Florido II, Florido sección I, poblado and of the Ejido Francisco Villas	PVC of 25, 38, 45, 61, 76 and 91 cm	7.440 km
Rosario Castellanos Sewage Subcollector	Located along the Cañón de Rosario (Rosario Canyon)	Colinas de la Cruz, Infonavit Lomas Verdes.	Concrete and PVC of 20,25 and 30 cm	2.990 km
Rosario Salado Sewage Subcollector	Located along the Cañón el Saldo. (El Saldo Canyon)	Colonias Colinas de la Sánchez Taboada, Anexa Sánchez Taboada, Irak, Cañón Salado, Emperadores, Guanajuato, La Villa and Jalisco, among others.	Concrete of 38 and 45 cm	2.970 km
Pressurizer Playas	Begins at the Rosarito station and ends in the Rosarito treament plant	Rosarito pumping station	Steel of 12 inch	3.000 km
Rosarito Norte Sewage Collector	Located along the highway to PEMEX and ending at the Rosarito station	Lienzo Charro, Los Ángeles, Tijuana, Villa del Mar, La Fuente, Anexa Obrera, Obrera and Baso.	PVC of 45 cm	2.650 km
Rosarito Sur Sewage Collector	Located along the Avenida Mar Adriático, in Playas de Rosarito and ending at the Rosarito station.	Playas de Rosarito, Centro Carretera, Centro Playas and Magisterial.	PVC of 30 and 45 cm	1.300 km

Source: Prepared with information provided by the Departamento de Control Operacional (Dept. of Operational Control), CESPT.

Table J-4 ***Colonias* (Neighborhoods) With Worn-Out Pipelines Needing Renovation.**		
System built between 1948 and 1960		
Zona Norte	Madero Sur	Aviación
Zona Centro (downtown)	Marrón	La Mesa
Independencia	Revolución	Cuauhtemoc
Zona Este	América	
Morelos Madero	Plan de Barranquitas	
System built between 1961 and 1970		
20 de noviembre	Empleado Postal	Luna Park
Alcalá	Francisco Villa	Luz Juárez
Alemán	Gavilondo	Magaña
Anáhuac	Guerrero	México
Anexa Roma	Herrera	Mineral Santa Fe
Angélica	Hidalgo	Moreno
Azcona	Hipódromo	Moreno
Baja California	Hipódromo dos	Neidhart
Benton	Infonavit Lomas del Porvenir	Orizaba
Buena Vista	Jardines de San Carlos	Paraíso
Burocrática Ruiz Cortines	Jardines de la Meza	Pino de Narez
Calete	José Sandoval	Pinos de Agüero
Castillo	Juárez	Quinta Alta
Castro	La Escondida	Rancho la Cima
Castro Green	La Joya	Reinoso Guillen
Cecena	Las Huertas	Rincón Colonial
Contrera Oeste	Las Lilas	Roma
Contreras	Las Palmas	Rubio
Cortes	Libertad	Santa Cruz
Cubillas Sur	Linda Vista	Santa Rosa
Cubillas	Lomas Conjunto Residencial	Sección Costa, Costa Azul
Chapultepec	Lomas del Mirador	Sección Costa de Oro
Chapultepec Este	Lomas del Pacífico	Sección Costa Hermosa
Chula Vista	Lomas Doctores	Sección Jardines
Dávila	Lomas Hipódromo	Sección Monumental
Del Río Reforma	Lomas Tijuana	Sección Playas Coronado
El Mirador	López Leyva	Sección Rivera (Coral Beach)
El prado	López Oeste	Soler
El Prado Este	López Reinoso	Triangulo de Oro
El Progreso	Los Ángeles	Unión
El Rubí	Los Olivos	Urías
	Los Volcanes	Valle del Rubí
System built between 1971 and 1975		
Lomas Misión	Jardines del Rubí	Internacional
Los Altos	La Sierra	Las Fuentes
Altamira	Sonora	Los Álamos
Altamira Sur	Sonorita	Guaycura
Patrimonial Benito Juárez	Monte Bello	Reforma
Chihuahua	Burócrata Hipódromo	
Obrera	Colinas de Agua Caliente	

Source: Prepared with information provided by the Departamento de Control Operacional (Dept. of Operational Control), CESPT.

Table J-5
Problems and Operating Conditions in the Sewage Collectors and Subcollectors

Name	Operation Conditions	Problems
Insurgentes Sewage Collector	Low capacity	Low capacity design, operates above planned capacity due to the growing demographic in the area. One of the problems that affects the operation of this sewage collector stems from the current design of the syphon box, which maintains a hydraulic charge and operates as a grit separator, affecting its carrying capacity when it clogs.
Central Sewage Collector	Poor structural conditions	Some sections are in poor condition structurally because of corrosion.The Central Sewage Collector is 32 years old and has not received preventive maintenance; therefore up to ¾ of its diameter is blocked.
V. Carranza Sewage Collector	Doesn't have recurrent problems	Preventive maintenance on the sewage collector has become difficult because of a lack of appropriate equipment. The sanitary sewer system was built before the sewage collector. The household discharges are at the same level, which means many of these go through the the sewage collector.
Oriente Sewage Collector	Lessening of the carrying capacity	There are sections of the sewage collector that have debris settling covering up to 1/2 the tube. Moreover sections with poor structural conditions have been identified due to the wear and tear and erosion caused by hydrogen sulfide.
Padre Kino Sewage Collector	Operating partially full	All of the manholes have not yet been found. This causes a backlog of preventive maintenance and problems of severe wear and tear from the accumulation of hydrogen sulfide gases.
Sánchez Taboada Sewage Collector	Lessening of the carrying capacity	There are problems with debris settling, accumulation of gases (hydrogen sulfide), erosion, structural faults, and settling. It operates at high levels. The adjacent sides have been repositioned. Maintenance has not been adequate, since it is difficult to do, principally in the Zona Río.
Old INV Sewage Collector	Poor structural conditions	Since 1992 it no longer functions as a sewage collector.Now it is a conduit. The pipeline has some areas of disintegration and some manholes are in bad shape and hidden. It receives minimal wastewater.
New INV Sewage Collector	Low Carrying Capacity	Low capacity due to the increase in population from the development of housing and the construction of *maquiladoras.* This collector runs at its maximum capacity; it has some spills causing run-off to the United States.
Poniente Interceptor	Problems along its route (right of way)	There are sections located in areas inaccesible to the cleaning equipment (vehicles, Vacom, Hidro- Clainer, etc.) leading to inadequate maintenance, principally from the town of La Presa to the Boulevard Lázaro Cárdenas. The access problems are due to the growing urban area and an ill-defined right-of way, with residential and industrial settlements being built on top of the interceptor pipe.
Pastejé Sewage Collector	Operational problems	Operational problems are located in poor topographical conditions, within the bed of the arroyo. The rain infrastructure impedes access for the maintenance equipment. Vandalism has caused problems with its operation because of objects and trash thrown into the interior of the manholes.
Ensenada Sewage Collector	Poor structural conditions	Concrete pipes have been exposed to severe wear and tear and eroded connections. It operates adequately in dry periods, but during rainy seasons it receives more wastewater than the maximum design volume, causing poor operation in the sections with minimal sloping.
Industrial Sewage Collector	Operates efficiently	Due to the establishment of factories along its route and land movement by area developers, the pipeline can now be found at depths of 11 m which makes maintenance very difficult.
Emiliano Zapata Sewage Collector	Operational Problems	In the low areas with minimal sloping there is a problem with debris settling and spills from wells, which is caused by a lack of preventive maintenance.
Rosario Castellanos Sewage Sub-Collector	Poor operating and structural conditions	Runs along the Rosario Castellanos Canyon, so during rainy periods it is used for rain water drainage, and at times neighbors even throw trash and refuse into the interior of the manholes, causing debris settlings and spills. Most of the pipeline has severe wear and tear, fractures, roots, deformations and in some sections total disintegration.
Rosario Salado Sewage Sub-Collector	Operating regularly	It has a section operating at ¾ of its capacity. The wells are generally in good condition.

Source: Prepared with information provided by the Departamento de Control Operacional (Dept. of Operational Control), CESPT.

Table J-6 ***Colonias* (Neighborhoods) Lacking Sewer Service**
3 de Octubre
Ampliacion Buenos Aires
Ampliacion Agraristas
Terrazas del Valle
Ampliación de las Aguilas
Ampliación Lazaro Cardenas
Ampliación Mariano Matamoros
Ampliación Pipila
Ampliación Ejido Francisco Villa
Ojo de Agua
Maclovio Rojas
Ampliación Plan Libertador
Cuesta Blanca
Ley del Servicio Civil
Tecolote Tercera Sección
Granjas Amparo Sanchez
Viñedos
Casa Blanca
Ampliació Maclovio Rojas
Rosarito
Playas de Rosarito
Plan livertados de Rosarito
Santa Monica
Reforma
Lucio Blanco
Colinas de Rosarito
Bajamar

Source: Prepared with information provided by the Departamento de Control Operacional (Dept. of Operational Control), CESPT.

Table J-7
Rehabilitation Projects to be done with CESPT Resources

Work	Diameter (cm)	Length (m)	Year of execution	District No.
Water conduit Av. Universidad between Dibujantes and Sociólogos in Otay Universidad	20	276	2001	3
Water conduit on Av. José María Larroque in Centro Comercial Viva Tijuana	20	216	2001	1
Water conduit on Av. Revolución between 2da. and Baja California, Zona Centro (downtown)	20	462	2001	3
Water conduit on Bulevar Agua Caliente in the Hipódromo Subdivision	20	395	2001	2
Water conduit on Calle Dibujantes in Otay Universidad	25	1000	2001	1
Water conduit on Calle Encomienda in the Los Olivos Subdivision	20	150	2001	2
Water conduit on Calle Federico Gamboa of the Modulo I in Mesa de Otay	20	200	2001	1
Water conduit on Calle Gabriela Mistral of the Modulo IV in Mesa de Otay	20	150	2001	1
Water conduit on Calle Michoacán and Mutualismo in Zona Norte	20	575	2001	3
Water conduit on Calle Ramón Corona between Garibaldi and Cañón México, Colonia Juárez	20	61	2001	2
Water conduit on Calle Río Amazonas in the Capistrano Subdivision	20 and 30	95	2001	4
Water conduit on Callejón "Z" between 2da. and 3ra. in the Zona Centro (downtown)	25	155	2001	3
Water conduit on Privada Tarahumaras in the La Sierra Subdivision	20	160	2001	2
Water conduit on Diplomáticos between Contadores and Veterinarios, Otay Universidad	20	514	2001	1
Water conduit on Avenida Alejandro Von Humbolt in the Modulo I in Mesa de Otay	35	450	2001	1
Water conduit on Calle Eliseo Castañeda in the Rubí Aguadores Subdivision	20	200	2001	3
Water conduit on the service road 2da. Poniente in Ciudad Industrial	30	500	2001	1
Water conduits on Calle Baja California between Mutualismo and 5 de Mayo in Zona Norte	25	178	2001	3
Los Reyes Sewage Collector and 20 m of steel in the Poniente Interceptor in Los Venados	45	437	2001	6
Oriente Sewage Collector on Vía Rápida in the Zona Río	61	560	2001	1
Connection of the Sewage Subcollector Ejercito Trigarantes of the La Joya Subdivision	45	86	2001	6
Different water conduits in the El Mirador subdivision	20	1000	2001	3
Different water conduits in the Soler Subdivision	20	500	2001	3
Different water conduits in the Módulos I, II, III and IV in Mesa de Otay	20	300	2001	1
Replace critical water conduits in the Colonia Los Altos	20	75	2001	1
Replace critical water conduits in the Zona Centro	20	1000	2001	3
Replace critical water conduits in the Zona Este	20	500	2001	3
Replace critical water conduits in the Zona Norte	20	500	2001	3
Replace critical water conduits in the Zona Río Oriente	20	600	2001	1
Replace critical water conduits in the Zona Río Poniente	20	1200	2001	2
Colonia Hipódromo Network	20 and 25	1880	2002	2
Colonia La Reforma Network	20 and 25	250	2002	6
Colonia Leos Montoya Network, Colonia Santa Rosa Network, Colonia Guillen Network	20 and 25	4600	2002	2
Cañón Altamira Sewage Subcollector	Expansion to	600	2002	3
Cañón González Bocanegra Sewage Subcollector	Expansion to	800	2002	3
Cañón Guerrero Sewage Subcollector, Cañón M. Herrera Sewage Subcollector	Expansion to	1350	2002	3
Cañón Progreso Sewage Subcollector, Cañón Yucatán Sewage Subcollector	Expansion to	1500	2002	3
Ensenada Sewage Collector	25, 38 and 45	1000	2003	2
Colonia Libertad Network	20 and 25	5000	2003	1
Cañón del Sol Sewage Subcollector	Expansion to	750	2003	3
Cañón Unión Sewage Subcollector	Expansion to	2550	2003	3
Villas de Baja California Sewage Subcollector	25 and 30	400	2003	6
Ciudad Industrial Network in Otay	20 and 25	500	2004	1
Colonia Los Álamos Network	20 and 25	1000	2004	1
El Mirador subdivision network, Rubí Norte subdivision network	20 and 25	3370	2004	3
Infonavit Alba Roja Network	20 and 25	1770	2004	6
Infonavit López Portillo Network	20 and 25	100	2004	4
Cañón Jonson Sewage Subcollector	Expansion to	2300	2004	3
Rampa Buena Vista Sewage Subcollector	30	2000	2004	1

Source: Prepared with information provided by the Departamento de Control Operacional (Dept. of Operational Control), CESPT.

Table J-8
Rehabilitation Projects to be done with EPA Resources Through CESPT

Work	Diameter (cm)	Length (m)	Year of Execution	District No.
Central Sewage Collector	38 and 61	1911	2001	3
Padre Kino Sewage Collector	61 and 76	1000	2001	1
Pastejé Sewage Collector	38 and 45	2500	2001	1
Sánchez Taboada Río Sewage Collector	91 and 107	2000	2001	3
Venustiano Carranza Sewage Collector	61	353	2001	3
Zona Río Network (1st Part)	20 and 25	11670	2001	2
Industrial Sewage Collector	30, 45, 61, 76 and 91	2200	2002	1
Oriente Sewage Collector	76 and 107	4614	2002	1
Pressure emitter (1st Part)	122	2500	2002	3
Interceptor Poniente (Las Arboledas-Los Venados section)	76	1000	2002	6
Interceptor Poniente (Lázaro Cárdenas- Las Arboledas section)	107	4600	2002	6
Col. Angélica network	20 and 25	300	2002	2
Zona Norte Network	20 and 25	9000	2002	3
Zona Río Network (2nd Part)	20 and 25	24830	2002	1
Farallón de Playas de Tijuana Sewage Collector	53, 76 and 91	3000	2003	3
Pressure Emitter (2da. Parte)	122	2000	2003	3
Interceptor Internacional	Expansion to 72 inches	2400	2003	3
Zona Este Network	20 and 25	15000	2003	3
Modules I and II Network in Otay Nueva Tijuana	20 and 25	10000	2003	1
Zona Central Network	20 and 25	17500	2003	3
Renovation of pumping plant #1		0	2003	3
I. N. V. Sewage Collector	25, 30, 38, 45 and 61	12920	2004	3
Insurgentes Sewage Collector	25	6000	2004	4
Colonia Aviación Network	20 and 25	1000	2004	2
Colonia Buena Vista Network	20 and 25	1000	2004	3
Col. Del Río P/B Network	20 and 25	1000	2004	1
Col. San Carlos Network in La Mesa	20 and 25	740	2004	2
Col. Santa Cruz Network	20 and 25	1220	2004	2
Otay Fovissste 5ta. Network	20 and 25	700	2004	1
Otay Universidad Network	20 and 25	1000	2004	1
Col. Castillo Network	20 and 25	700	2004	3
Sandoval Subdivision Network	20 and 25	1600	2004	2
Otay Constituyentes Network	20 and 25	500	2004	1
Otay Fovissste 2da. Network	20 and 25	350	2004	1

Source: Prepared with information provided by the Departamento de Control Operacional (Dept. of Operational Control), CESPT.

Table J-9
Planned Works for the Japanese Credit

Name of the Project	Population Benefitted (No. of Inhabitants)	Pipeline diameter (cm) and length (m)								
		15	20	25	30	38	46	61	76	HP
San Ángel	4,595	8,754	9,715		1,057					
Pedregal de Santa Julia	7,140	13,700	28,200		1,900					
Crosswhite	8,249	15,714	25,138		665					200
Ampliación Constitución	7,367	14,036	30,220		593	1,579				
Lucio Blanco	30,450	13,010	14,531	424	711					
Divina Providencia	4,830	9,200	23,826		1,236					
Flores Magón and Salvatierra	19,144	36,466	72,175	470						
Los Laureles (Pumping Station)							2,460			350
Vista Encantada	2,449	4,667	4,555							
Cumbres	8,312	12,072	19,988	383	348	2,475				
Ampliación Lázaro Cárdenas	802	1,531	2,837							
Las Torres I	7,837	14,933	29,292	110						
Buenos Aires expansion	14,057	26,779	23,256							
Lomas del Matamoros	3,381	6,442	10,186							
Ejido Mariano Matamoros	7,925	15,098	34,803	1,805						
El Pípila	26,670	52,003	51,234	1,202	458					
Colinas del Matamoros	4,607	6,692	11,648							
Nido de las Águilas	6,842	13,036	27,517	628	262					
10 de Mayo, Insurgentes	4,200	8,008	8,821	201	403					
Ampliación Ejido Matamoros Planicie, Mirador, Altiplano y Pedregal	21,000	40,138	44,469	1,195	567	1,214				
Ensenada II Sewage	150,240		540	860	480	140	3,131	680	240	
Zona Urbana del Ejido Lázaro Cárdenas	1,260	2,403	8,411							
Lagunitas	4,733	7,698	13,444							
Cañón del Sainz Sewage Subcollector	84,038				171	1,135	336	2,605		
San Luis- Emiliano Zapata	7,169	10,413	22,100	502	720					
Ampliación Ejido Francisco Villa	14,595	27,810	31,836	262						
Florido IV	8,413	16,025	14,186		769	390				
Terrazas del Valle	20,908	39,827	35,758	622	98				1,029	
La Morita II	6,019	12,182	9,026		408				492	
La Morita I	7,736	15,659	10,966		318			302	643	
Tecolote 3ra. Sección	1,033	1,970	3,666		110	2,178				
Granjas Amparo Sánchez	1,453	2,770	6,140							
3 de Octubre	18,900	36,002	43,250		1,250					
Ampliación Agraristas	3,629	6,912	9,223							
Viñedos Casa Blanca	3,608	6,875	10,431	1,214					733	
Total	289,313	498,825	691,388	9,878	12,524	9,111	5,927	3,587	3,137	550

Source: Prepared with information provided by the Departamento de Control Operacional (Dept. of Operational Control), CESPT.

APPENDIX K
Sustainable Development Criteria

Aggregated Indicators for Alternatives Evaluation									
#	Key Indicator	Indicators Provided by BTC NS = New Water Source PW = Potable Water WC = Wastewater Collection TR = Wastewater Treatment & Reuse	Environment & Ecosystem Sustainability	Human Health Sustainability	Technical Sustainability	Financial Sustainability	Socio-economic Sustainability	Community Participation	Risk
1	Present value cost of alternative								
		NS Actual water rates				X	X	X	
		NS Cost-benefit analysis				X			
		NS Phased financing scheme				X			
		NS Private sector participation				X			
2	Cost of operations and maintenance								
		NS Cost of operation and maintenance for new water sources			X				
		TR Cost of sludge disposal and reuse per cubic meter			X	X			
		TR Cost per cubic meter of water				X	X		
		PW Production cost per cubic meter					X		
		PW Operating cost optimization			X	X			
3	Annual energy use (Kwh)								
		NS Efficient energy use	X						
		NS Use of new technology			X				
		NS Energy generation within the system			X				
		NS Natural gas usage			X		X		
		TR Efficiency (%) of the treatment plants			X	X			X
		NW Use of alternative energy systems	X						
4	Level of implementation risk								
		NS Political situation							X
		NS Financial and economic crises							X
		NS Linkage between new sources and growth			X		X		
		NS Emergency storage			X				
		NW Use of alternative energy systems	X						
		NS Implementation period for new water sources			X	X	X		
		NS Use of new technology			X				
		PW Land use control (variability in land use and development)							X
		PW Contingency plan							X
		WC New sanitary sewer hook ups	X	X	X	X	X	X	X
5	Reduce environmental impacts								
		NS Reduced environmental impact			X	X	X		

Aggregated Indicators for Alternatives Evaluation									
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6	Adequate Infrastructure Improvements in Time								
		NS Water quantity		X					
		PW Capacity for potable water treatment		X			X		
		PW Replacement of distribution lines (%)				X			
		WC New sanitary sewer hook ups	X	X	X	X	X	X	X
		TR Percentage of sewage treated	X	X	X				
		TR Kilometers of water reuse pipeline			X		X		
7	Percentage of hydraulic capacity needed that is in place								X
		NS Water supply conveyance infrastructure			X				
		PW Replacement of distribution lines (%)				X			
		WC Hydraulic capacity of sewer lines	X	X	X	X	X	X	X
		WC Sewer replacement and rehabilitation programs			X	X			
		WC Storm water impact on the sewage collection system	X	X	X				
		WC Construction of a storm water collection system	X	X	X	X	X	X	X
		WC Infiltration/inflow volume into the sanitary sewers			X				
		WC Strategic planning of sanitary system infrastructure (phasing)			X	X		X	X
		WC Control of discharges from runoff							X
8	Number of sources of water and their respective contributions								
		PW Water supply alternatives							X
		NS Diversified sources of water							X
		NS Seismic risk							X
		NS Terrorism and sabotage							X
9	Percentage of water conserved and reduction in water losses								
		PW Response time for reporting water leaks				X			
		PW Percentage of water lost (a. actual; b. commercial)				X			
		PW Percentage of water meters				X			
		PW Water meter accuracy				X			
		NS Optimize resources through demand reduction					`		X
		NS Water conservation						X	
		PW Per person water consumption						X	
		TR Volume of industrial wastewater reused	X		X				
10	The ratio of ground water extraction to artificial groundwater recharge								

Aggregated Indicators for Alternatives Evaluation									
#	**Key Indicator**	**Indicators Provided by BTC** NS = New Water Source PW = Potable Water WC = Wastewater Collection TR = Wastewater Treatment & Reuse	**Environment & Ecosystem Sustainability**	**Human Health Sustainability**	**Technical Sustainability**	**Financial Sustainability**	**Socio-economic Sustainability**	**Community Participation**	**Risk**
		NS Aquifer withdrawal and recharge	X						
		PW Ground water extraction (sustainable)	X						
		TR Infiltration volume into the aquifer	X	X					
		TR Volume of water recharging the aquifer						X	X
		NS ART reuse alternatives		X	X				
11	Percentage of potable water that meets quality standards throughout the distribution network								
		PW Capacity for potable water treatment		X			X		
		NS Compliance with quality standard (N127)		X					
		PW Homogeneity of water quality delivered		X					
		PW Water quality		X					
		PW Chlorine residual		X					
		PW Total coliform		X					
		PW Total dissolved solids		X					
12	Percentage of population in service area that has water service								
		PW Percentage of population supplied		X					
		PW Percentage of service area that has water supply		X					
13	Average hours/day that water service is provided								
		PW Service continuity		X					
		PW Hours/day water service provided		X					
		PW Complaints (lack of water service)		X					
		PW Storage volume				X			
		PW Pressure zones (coverage)				X			
		PW Regulation volume (%)				X			
14	Percentage of population with sanitary service								X
		WC Percentage of population with sanitary service							X
15	Percentage of municipal wastewater generated that is discharged in compliance with standards								
		WC Number of sewage spills per month	X	X					
		TR Number of sewage spills	X	X					
		TR Volume spilled	X	X					
		TR Percentage of sewage treated	X	X	X				
		TR Sewage treatment capacity	X		X	X			

Aggregated Indicators for Alternatives Evaluation									
#	Key Indicator	Indicators Provided by BTC NS = New Water Source PW = Potable Water WC = Wastewater Collection TR = Wastewater Treatment & Reuse	Environment & Ecosystem Sustainability	Human Health Sustainability	Technical Sustainability	Financial Sustainability	Socio-economic Sustainability	Community Participation	Risk
		TR Efficiency (%) of the treatment plants			X	X			X
		TR Days/year of violations of effluent discharge requirements			X			X	
		TR Treated effluent volume	X	X					
		PW Number of private plants			X				
		TR Sewage volume treated in private plants inside and outside the sewage collection system			X				
		TR Treated effluent quality	X	X	X				
		TR Number of complaints due to odors					X	X	
		TR Volume of tertiary effluent	X		X				
16	Volume of wastewater discharged to transboundary waters (Tijuana and Alamar rivers, river canyons, and the Pacific Ocean)								
		TR Volume spilled	X	X					
17	Efficient sludge management								
		PW Environmental impacts of water treatment sludge	X						
		TR Sludge handling	X						
		TR Sludge quality	X		X	X			
		TR Sludge volume generated and reused			X	X			
18	Percentage of effluent volume reused								
		NS Reuse infrastructure			X				
		PW Wastewater recovery	X						
		PW Environmental impacts of water reuse	X						
		TR Percentage of effluent volume reused			X	X			
		TR Kilometers of water reuse pipeline			X		X		

X Indicator

X Key indicator